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EXAMINER
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LEE, SIN J

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 09/05/2003

7

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/955,111

Applicant(s)

MAEMORI ET AL.

Examiner

Sin J Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 19 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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**DETAILED ACTION**

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In claim 1, applicants state, "a surface active

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agent in a concentration not exceeding 50 ppm by weight . . . *but sufficiently high to effect substantial decrease of defects in a patterned resist layer formed from the photoresist composition*". There is no support for this limitation in the original disclosure. What the section [0036] of present specification is saying is that *when the thickness of the photoresist layer is in the range of 100 to 650 nm*, the number of defects in the patterned resist layer after development can be greatly decreased even if the concentration of a surfactant in the composition is so low as not to exceed 50 ppm by weight. This section of the specification is not saying that the concentration of the present surfactant has to be sufficiently high to effect substantial decrease of defects in a patterned resist layer. In fact, in [0033], applicants state that the requirement that the present invention contains a surfactant in a concentration not exceeding 50 ppm by weight can be accomplished by *removing* the surfactant *as completely as possible* prior to application of the composition onto the substrate surface by using an adsorbent. Therefore, original disclosure does not provide proper support for the present limitation of claim 1.

4. Claims 1, 4, 5, 10-12, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawabe et al (EP 0 952 489 A1).

Kawabe teaches (pg.6, lines 24-31 and [0153]) a positive photosensitive resin composition suitable for use with ArF excimer and KrF excimer exposure apparatus comprising (A) a polymer which has bridged alicyclic hydrocarbon skeletons and decomposes under the action of an acid to be rendered soluble in alkali, (B) a compound which generates an acid upon irradiation with actinic rays, (C) a nitrogen-

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containing basic compound, (D) at least one of a fluorine-containing surfactant and a silicon-containing surfactant, and (E) a solvent. Kawabe furthermore teaches (see [0111]) that the ratio of the polymer (A) to surfactant (D) is from 500 to 20,000 by weight. Since 20,000 is clearly included as the higher end of the taught range, one of ordinary skill in the art would immediately envisage the (A)/(D) ratio to be 20,000. This ratio, when converted to ppm, gives 50 ppm of the surfactant (D) based on the amount of the polymer (A), and this amount of the surfactant taught by Kawabe teaches present concentration of *not exceeding 50 ppm* by weight based on the amount of the resinous compound as presently cited in claim 1 (since Kawabe teaches the use of 50 ppm of the surfactant, and since the present claim cites 50 ppm as the maximum amount of the surfactant, it is the Examiner's position that this amount is sufficiently high to effect substantial decrease of defects in a patterned resist layer as presently stated in claim 1). Also, Kawabe teaches that the suitable thickness of a resist film made of their composition coated on a substrate is in a range of about 0.1 to 10  $\mu\text{m}$ , which converts to 100-10,000 nm. Since 100 nm is clearly shown as the lower end of the range, it is the Examiner's position that one of ordinary skill in the art would immediately envisage 100 nm to be the thickness of Kawabe's resist film coated on a substrate. Therefore, the prior art teaches present inventions of claims 1, 10-12, and 15.

With respect to present claims 4 and 5, in their Synthesis Example 2, Kawabe teaches a polycyclic alicyclic polymer containing  $-\text{COO}(\text{CH}_3)_3$  pendent moiety. Therefore, the prior art teaches presently claimed tertiary alkyloxycarbonyl group and tert-butyloxycarbonyl group of claims 4 and 5.

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5. Claims 13 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawabe et al (EP 0 952 489 A1).

Kawabe et al teach ([0103]) the amount of their component (C) a nitrogen-containing basic compound (such as triethylamine and tributylamine) to be 0.001 to 10 parts by weight per 100 parts by weight of the solids components of their composition. Since this range overlaps with present range of claim 13, the prior art's teaching would have made present range *prima facie* obvious. In the case "where the [claimed] ranges overlap or lie inside ranges disclosed by the prior art," a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Therefore, Kawabe's teaching would render obvious present invention of claim 13.

As explained above in Paragraph 4, Kawabe teaches that the suitable thickness of a resist film made of their composition coated on a substrate is in a range of about 0.1 to 10  $\mu\text{m}$ , which converts to 100-10,000 nm. Since this range overlaps with present range of claim 17, the prior art's range would have made present range *prima facie* obvious. See In re Wertheim, supra. Therefore, Kawabe's teaching would render obvious present invention of claim 17.

6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawabe et al (EP 0 952 489 A1) in view of Sato et al (5,948,589).

Kawabe et al with respect to claim 1 is discussed above in Paragraph 4. Kawabe et al do not teach the use of presently claimed carboxylic acid compound of claim 14.

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However, it is well known in the art to use a carboxylic acid compound in a positive working photoresist composition to prevent an undue decrease in the photosensitivity of the composition due to the presence of an amine compound, and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer. See Sato et al, col.7, lines 54-61. Sato teaches the amount of the carboxylic acid to be 0.01 to 5 wt% based on the amount of a resinous compound having acid-decomposable group. Therefore, it would have been obvious to one of ordinary skill in the art to use a carboxylic acid compound in Kawabe's composition in the amount of 0.01 to 5 wt% based on the amount of Kawabe's resin binder with a reasonable expectation of preventing an undue decrease in the photosensitivity of the composition due to the presence of an amine compound and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer as taught by Sato et al. Since the prior art's range overlaps with present range (which converts to 0.01 to 1wt%), the prior art's teaching would have made present range *prima facie* obvious. See In re Wertheim, supra. Therefore, Kawabe in view of Sato would render obvious present invention of claim 14.

7. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawabe et al (EP 0 952 489 A1) in view of Padmanaban et al (6,329,117 B1).

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Kawabe et al with respect to claim 15 is discussed above in Paragraph 4.

Kawabe does not teaches presently claimed antireflection coating film of present claim 16. However, it is well known in the art to provide an anti-reflective coating film between a substrate and a positive working chemically amplified deep UV photoresist composition layer in order to reduce problems associated with reflected light from the substrate and topography during pattern formation. See Padmanaban, col.3, lines 52-56 and col.11, lines 55-67. Padmanaban teaches forming such anti-reflective coating film having thickness of 60 nm on a silicon wafer. Based on Padmanaban's teaching, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to provide an anti-reflective coating film having thickness of 60 nm between Kawabe's substrate and Kawabe's photoresist composition layer with a reasonable expectation of reducing problems associated with reflected light from the substrate and topography during pattern formation as taught by Padmanaban et al. Therefore, Kawabe in view of Padmanaban would render obvious present invention of claim 16.

8. Claims 1, 2, 4, 5, and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Fujie et al (6,303,264 B1).

Fujie et al teach (col.2, lines 13-21 and Example 1) a chemical amplified type positive working resist composition suitable for use with KrF excimer laser comprising a polymer capable of becoming alkali-soluble owing to the action of an acid such as *poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene]*, a photoacid generator, and a solvent. Fujie furthermore teaches (col.20, lines 20-23, lines 59-61, col.21, lines 1-4) that surfactants such as fluorine-containing nonionic surfactants can be added in the



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amount of 0.001 to 10 parts by weight per 100 parts by weight of his polymer components (which converts to 0.001 to 10 wt%) to his composition to aid the formation of a resist film. Since 0.001 wt% is clearly shown as the lower end of the taught range, it is the Examiner's position that one of ordinary skill in the art would immediately envisage using 0.001 wt% of the surfactant in Fujie's invention. Since present range of 50 ppm or less converts to 0.005 wt% or less, Fujie teaches present inventions of claims 1, 2, 4, 5, and 10 (present specification [0033] states that the number of defects in the resist layer after patterning cannot be decreased when the concentration of the surfactant is exceeding 50 ppm (0.005 wt%) and that the *surfactant can even be removed as completely as possible* from the composition in order to ensure that the concentration of the surfactant is not exceeding 50 ppm. Therefore, since Fujie teaches the use of 0.001 wt% of the surfactant, it is the Examiner's position that 0.001 wt% of the surfactant would clearly be high enough to effect substantial decrease of defects in a patterned resist layer as presently cited in claim 1. Also, in Fujie's poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene], the acid-dissociable group would be 1-ethoxyethyl group (an alkoxyalkyl group)). It is the Examiner's position that since the prior art teaches all of the presently components of claim 1, the prior art's composition would inherently be suitable for the formation of a photoresist layer having a thickness in the range from 100 to 650 nm on the surface of a substrate as presently recited.

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9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujie et al (6,303,264 B1).

Fujie teaches (col.20, lines 24-51) that sensitivity adjustors such as trialkylamines (in Example 1, Fujie specifically uses tri-n-propylamine compound) can be added in the amount of 0.001 to 10 parts by weight per 100 parts by weight of their polymer components. Since this range overlaps with present range of 0.01 to 1 part by weight, the prior art's range would have made present range *prima facie* obvious. See In re Wertheim, supra. Therefore, Fujie's teaching would render obvious present invention of claim 13.

10. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujie et al (6,303,264 B1) in view of Urano et al (JP 05-194472, and its machine-assisted English translation).

Fujie et al is discussed above in Paragraph 8. In Example 1, Fujie's composition contains poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene]. In Example 2, his composition contains poly(p-tert-butoxystyrene/p-hydroxystyrene, and in Example 3, his composition contains poly-(p-1-tetrahydropyranyloxystyrene/p-hydroxystyrene). However, the prior art does not specify what molar % of the acid dissociable groups (such as 1-ethoxyethyl group, tert-butyl group and tetrahydropyranyl group) are substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene. Fujie states in col.14, lines 8-12 that his polymer capable of becoming alkali-soluble can be obtained by the processes disclosed in JP 05-194472 (Urano et al). In the machine-assisted translation of the Japanese document (see [0022] and [0023]), it is indicated

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that poly(p-tert-butoxystyrene/p-hydroxystyrene and poly-(p-1-tetrahydropyranyloxystyrene/p-hydroxystyrene) are synthesized, and in both of the instances, the acid-dissociable groups (tert-butyl group and tetrahydropyranyl group) are being present in the amount of *10 molar %*. It is the Examiner's position that it would have been obvious to one of ordinary skill in the art to make Fujie's polymers which are capable of becoming alkali-soluble (such as the ones shown in his Examples) such that the acid-dissociable groups in each polymer would be present in the amount of 10 molar % because Fujie refers to JP 05-194472 for the synthesis of his polymers and because the Japanese document clearly teaches that the acid-dissociable groups are substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene in the amount of 10 molar %. Therefore, Fujie in view of Urano would render obvious present invention of claim 6.

With respect to present claim 7, in Example 20 (see Table 8), Fujie uses combination of 4.5 g of poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene] (Mw:20,000 and dispersity:1.85) and 1.5 g of poly[p-tert-butyloxycarbonyloxystyrene/p-hydroxystyrene] (Mw: 8,000 and dispersity:1.85). As discussed above with respect to claim 6, it would have been obvious to one of ordinary skill in the art to make Fujie's polymers in Example 20 such that the acid-dissociable groups in each polymer would be present in the amount of 10 molar % because Fujie refers to JP 05-194472 for the synthesis of his polymers and because the Japanese document clearly teaches that the acid-dissociable groups are substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene in the amount of 10 molar %. Therefore, Fujie in view of Urano would

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render obvious present invention of claim 7 (present ratio of (b1):(b2) for Fujie's polymers in his Example 20 would be 0.333 which lies between present range of 10:90 (0.111) to 90:10 (9)).

With respect to present claim 9, in Example 19 (see Table 8), Fujie uses combination of 4.5 g of poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene] (Mw:20,000 and dispersity:1.80) and 1.5 g of poly[p-tert-butoxystyrene/p-hydroxystyrene] (Mw: 8,000 and dispersity:1.95). As discussed above with respect to claim 6, it would have been obvious to one of ordinary skill in the art to make Fujie's polymers in Example 19 such that the acid-dissociable groups in each polymer would be present in the amount of 10 molar % because Fujie refers to JP 05-194472 for the synthesis of his polymers and because the Japanese document clearly teaches that the acid-dissociable groups are substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene in the amount of 10 molar %. Therefore, Fujie in view of Urano would render obvious present invention of claim 9 (present ratio of (b1):(b2) for Fujie's polymers in his Example 19 would be 0.333 which lies between present range of 10:90 (0.111) to 90:10 (9)).

With respect to present claim 8, as explained above, in his Example 19, Fujie uses combination of 4.5 g of poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene] (Mw:20,000 and dispersity:1.80) and 1.5 g of poly[p-tert-butoxystyrene/p-hydroxystyrene] (Mw: 8,000 and dispersity:1.95). Fujie also teaches the equivalence of poly[p-tert-butoxystyrene/p-hydroxystyrene] and poly[p-tetrahydropyranyloxystyrene/p-hydroxystyrene] in col.11, lines 24-44. Because the prior art teaches the equivalence of these two polymers, it is the Examiner's position that it would have been obvious to one

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of ordinary skill in the art to replace the poly[p-tert-butoxystyrene/p-hydroxystyrene] in Fujie's Example 19 with the poly[p-tetrahydropyranyloxystyrene/p-hydroxystyrene] and use the combination of 4.5 g of poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene] (Mw:20,000 and dispersity:1.80) and 1.5 g of poly[p-tetrahydropyranyloxystyrene/p-hydroxystyrene] (Mw: 8,000 and dispersity:1.95). As discussed above with respect to claim 6, it would have been obvious to one of ordinary skill in the art to make Fujie's polymers in Example 19 such that the acid-dissociable groups in each polymer would be present in the amount of 10 molar % because Fujie refers to JP 05-194472 for the synthesis of his polymers and because the Japanese document clearly teaches that the acid-dissociable groups are substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene in the amount of 10 molar %. Therefore, Fujie in view of Urano would render obvious present invention of claim 8 (present ratio of (b1):(b2) for Fujie's polymers would be 0.333 which lies between present range of 10:90 (0.111) to 90:10 (9)).

11. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujie et al (6,303,264 B1) in view of Sato et al (5,948,589).

Fujie et al is discussed above in Paragraph 8. Fujie et al do not teach the use of presently claimed carboxylic acid compound of claim 14. However, it is well known in the art to use a carboxylic acid compound in a positive working photoresist composition to prevent an undue decrease in the photosensitivity of the composition due to the presence of an amine compound, and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of

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substrates to give a satisfactory patterned resist layer. See Sato et al, col.7, lines 54-61. Sato teaches the amount of the carboxylic acid to be 0.01 to 5 wt% based on the amount of a resinous compound having acid-decomposable group. Therefore, it would have been obvious to one of ordinary skill in the art to use a carboxylic acid compound in Fujie's composition in the amount of 0.01 to 5 wt% based on the amount of Fujie's resin binder with a reasonable expectation of preventing an undue decrease in the photosensitivity of the composition due to the presence of an amine compound and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer as taught by Sato et al. Since the prior art's range overlaps with present range (which converts to 0.01 to 1wt%), the prior art's teaching would have made present range *prima facie* obvious. See In re Wertheim, supra. Therefore, Fujie in view of Sato would render obvious present invention of claim 14.

12. Claims 1, 3-5, 10, 13, 15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,365,321 B1) in view of Kawabe et al (EP 0 952 489 A1).

Chen et al teach a photoresist binder composition comprising a homogeneous blend of (i) a hydroxystyrene copolymer comprising a first monomer that is substituted or unsubstituted hydroxystyrene and a second monomer containing a photoacid-cleavable alicyclic ester group, and (ii) a phenolic polymer, wherein the phenolic polymer is selected from the group consisting of polyhydroxystyrene, poly(hydroxystyrene-co-styrene), *poly(hydroxystyrene-co-styrene-co-t-butyl acrylate)*,

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novolac, and combinations thereof. See claims 1 and 10. Since there are only four examples given for the phenolic polymer component, it is the Examiner's position that one of ordinary skill in the art would immediately envisage poly(hydroxystyrene-co-styrene-co-*t*-butyl acrylate) to be the phenolic polymer component in Chen's invention. Since Chen's poly(hydroxystyrene-co-styrene-co-*t*-butyl acrylate) contains the *t*-butyl acrylate repeating unit, the prior art's phenolic polymer contains an acid-dissociable group (*tert*-butyl group) which is capable of being imparted with increased solubility in an aqueous alkaline solution by interaction with an acid. Chen's lithographic resist composition additionally comprises a *radiation-sensitive acid generator* which generates an acid upon exposure to radiation such as *KrF excimer* and a solvent. See col.2, lines 30-33, col.8, lines 60-61, and col.10, lines 44-48.

Although Chen teaches (col.9, lines 51-53) that surfactants may be used in his composition to improve coating uniformity, the prior art does not explicitly teach the amount of the surfactants to be used. Kawabe et al, a reference which also teaches a positive photosensitive resin composition, teach (see [0099], [0102], [0108], [0112]) that the combined use of a basic compound (organic amines such as piperidine, pyridines, triethylamine and tributylamine) and fluorine and/or silicon-containing surfactants reduces development defects of the photoresist composition. Kawabe furthermore teaches (see [0111]) that the ratio of the polymer to surfactant is from 500 to 20,000 by weight. Since 20,000 is clearly included as the higher end of the taught range, one of ordinary skill in the art would immediately envisage the polymer/surfactant ratio to be 20,000. This ratio, when converted to ppm, gives 50 ppm of the surfactant based on

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the amount of the polymer. Based on Kawabe's teaching, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to use 50 ppm of the fluorine and/or silicon-containing surfactants together with a basic compound in Chen's composition in order to reduce development defects of a photoresist composition as taught by Kawabe especially since Chen also teaches the use of nitrogenous compounds such as tertiary amines, piperidines, pyridines as acid-diffusion controlling additives and stabilizers (see col.9, lines 35-40). Since 50 ppm of the surfactant teaches present concentration of *not exceeding 50 ppm* by weight based on the amount of the resinous compound as presently cited in claim 1, Chen in view of Kawabe would render obvious present inventions of claims 1, 3-5, and 10 (since Chen in view of Kawabe teach the use of 50 ppm of the surfactant, and since the present claim cites 50 ppm as the maximum amount of the surfactant, it is the Examiner's position that this amount is sufficiently high to effect substantial decrease of defects in a patterned resist layer as presently stated in claim 1. Also, since Chen in view of Kawabe teach all of the claimed components for the present chemical-amplification positive-working photoresist composition, it is the Examiner's position that the composition taught by Chen in view of Kawabe would inherently be suitable for the formation of a photoresist layer having a thickness in the range of 100-650 nm on the surface of a substrate as presently recited).

With respect to present claim 13, although Chen teaches the use of nitrogenous compounds (such as tertiary amines) as stabilizers and acid-diffusion controlling additive, the prior art does not explicitly teach the amount of such compounds to be used. As explained above, Kawabe teaches the combined use of a basic compound



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(organic amines such as triethylamine and tributylamine) and fluorine and/or silicon-containing surfactants in order to reduce development defects of the photoresist composition. Kawabe teaches the amount of the basic compound to be from 0.001 to 10 parts by weight per 100 parts by weight of solids in the composition, which converts to 0.001 to 10 wt%. It is the Examiner's position that it would have been obvious to one of ordinary skill in the art to use 0.001 to 10 wt% of Chen's nitrogenous compound (such as tertiary amines) together with fluorine and/or silicon-containing surfactants in Chen's invention with a reasonable expectation of reducing development defects of their photoresist composition as taught by Kawabe. Since the prior art's range for the amount of the nitrogenous compound overlaps with present range of claim 13 (which converts to 0.01 to 1 wt%), the prior art's range would have made present range *prima facie* obvious. See In re Wertheim, supra. Therefore, Chen in view of Kawabe would render obvious present invention of claim 13.

With respect to present claims 15 and 17, Chen teaches (col.10, lines 21-44) coating a substrate with a film comprising their lithographic resist composition, and the prior art furthermore teaches the thickness of the dried film made of their lithographic resist composition to be 0.1-5.0 microns, which converts to 100-5000 nm. Since this range overlaps with present range of 100-650 nm of claim 15 and 300-570 nm of claim 17, the prior art's teaching would have made present ranges *prima facie* obvious. See In re Wertheim, supra. Therefore, Chen in view of Kawabe would render obvious present inventions of claims 15 and 17.

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13. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,365,321 B1) in view of Kawabe et al (EP 0 952 489 A1) as applied to claim 1 above, and further in view of Sato et al (5,948,589).

Chen et al in view of Kawabe et al is discussed above in Paragraph 12. Chen et al in view of Kawabe et al do not teach the use of presently claimed carboxylic acid compound of claim 14. However, it is well known in the art to use a carboxylic acid compound in a positive working photoresist composition to prevent an undue decrease in the photosensitivity of the composition due to the presence of an amine compound, and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer. See Sato et al, col.7, lines 54-61. Sato teaches the amount of the carboxylic acid to be 0.01 to 5 wt% based on the amount of a resinous compound having acid-decomposable group. Therefore, it would have been obvious to one of ordinary skill in the art to use a carboxylic acid compound in Chen's composition in the amount of 0.01 to 5 wt% based on the amount of Chen's resin binder with a reasonable expectation of preventing an undue decrease in the photosensitivity of the composition due to the presence of an amine compound and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer as taught by Sato et al. Since the prior art's range overlaps with present range (which converts to 0.01 to 1wt%), the prior art's teaching would have made present range *prima facie* obvious.

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See In re Wertheim, supra. Therefore, Chen in view of Kawabe, and further in view of Sato would render obvious present invention of claim 14.

14. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,365,321 B1) in view of Kawabe et al (EP 0 952 489 A1) as applied to claim 15 above, and further in view of Padmanaban et al (6,329,117 B1).

Chen et al in view of Kawabe et al is discussed above in Paragraph 12. Chen in view of Kawabe do not teaches presently claimed antireflection coating film of present claim 16. However, it is well known in the art to provide an anti-reflective coating film between a substrate and a positive working chemically amplified deep UV photoresist composition layer in order to reduce problems associated with reflected light from the substrate and topography during pattern formation. See Padmanaban, col.3, lines 52-56 and col.11, lines 55-67. Padmanaban teaches forming such anti-reflective coating film having thickness of 60 nm on a silicon wafer. Based on Padmanaban's teaching, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to provide an anti-reflective coating film having thickness of 60 nm between Chen's substrate and Chen's photoresist composition layer with a reasonable expectation of reducing problems associated with reflected light from the substrate and topography during pattern formation as taught by Padmanaban et al. Therefore, Chen in view of Kawabe, and further in view of Padmanaban would render obvious present invention of claim 16.

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15. Claims 1, 3-5, 10, 13, 15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,365,321 B1) in view of Fujie et al (6,303,264 B1).

Chen et al teach a photoresist binder composition comprising a homogeneous blend of (i) a hydroxystyrene copolymer comprising a first monomer that is substituted or unsubstituted hydroxystyrene and a second monomer containing a photoacid-cleavable alicyclic ester group, and (ii) a phenolic polymer, wherein the phenolic polymer is selected from the group consisting of polyhydroxystyrene, poly(hydroxystyrene-co-styrene), *poly(hydroxystyrene-co-styrene-co-t-butyl acrylate)*, novolac, and combinations thereof. See claims 1 and 10. Since there are only four examples given for the phenolic polymer component, it is the Examiner's position that one of ordinary skill in the art would immediately envisage poly(hydroxystyrene-co-styrene-co-t-butyl acrylate) to be the phenolic polymer component in Chen's invention. Since Chen's poly(hydroxystyrene-co-styrene-co-t-butyl acrylate) contains the *t-butyl acrylate* repeating unit, the prior art's phenolic polymer contains an acid-dissociable group (*tert-butyl group*) which is capable of being imparted with increased solubility in an aqueous alkaline solution by interaction with an acid. Chen's lithographic resist composition additionally comprises a *radiation-sensitive acid generator* which generates an acid upon exposure to radiation such as *KrF excimer*. See col.2, lines 30-33, col.10, lines 44-48.

Although Chen teaches (col.9, lines 51-53) that surfactants may be used in his composition to improve coating uniformity, the prior art does not explicitly teach the amount of the surfactants to be used. Fujie et al, a reference which also teaches a

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chemical amplified positive resist composition, teaches (col.20, lines 61-67, col.21, lines 1-4) that surfactants preferably used to aid formation of a resist film are fluorine-containing nonionic surfactants and that the amount of the surfactants is preferably 0.001 to 10 parts by weight per 100 parts by weight of the polymer components, which converts to 0.001 to 10 wt%. Based on Fujie's teaching, it is the Examiner's position that it would have been obvious to use 0.001 to 10 wt% of fluorine-containing nonionic surfactants in Chen's invention with a reasonable expectation of aiding formation of their resist film as taught by Fujie. Furthermore, since 0.001 wt% is taught as the lower end of the prior art's range, one of ordinary skill in the art would immediately envisage using 0.001 wt% of the surfactant in Chen's invention in order to aid formation of Chen's resist film. Since present range of 50 ppm or less converts to 0.005 % or less, Chen in view of Fujie would render obvious present inventions of claims 1, 3-5, and 10 (present specification [0033] states that the number of defects in the resist layer after patterning cannot be decreased when the concentration of the surfactant is exceeding 50 ppm (0.005 wt%) and that the *surfactant can even be removed as completely as possible* from the composition in order to ensure that the concentration of the surfactant is not exceeding 50 ppm. Therefore, since Fujie teaches the use of 0.001 wt% of the surfactant, it is the Examiner's position that 0.001 wt% of the surfactant would clearly be high enough to effect substantial decrease of defects in a patterned resist layer as presently cited in claim 1. Also, since Chen in view of Fujie teach all of the claimed components for the present chemical-amplification positive-working photoresist composition, it is the Examiner's position that the composition taught by Chen in view of

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Fujie would inherently be suitable for the formation of a photoresist layer having a thickness in the range of 100-650 nm on the surface of a substrate as presently recited).

With respect to present claim 13, although Chen teaches the use of nitrogenous compounds (such as tertiary amines) as stabilizers and acid-diffusion controlling additive, the prior art does not explicitly teach the amount of such compounds to be used. Fujie also teaches (col.20, lines 24-51) using nitrogenous compounds (such as trialkylamines) as sensitivity adjusters in the amount of 0.001-10 parts by weight per 100 parts by weight of the polymer components. Since Chen is silent as to the amount of their nitrogenous compound, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to use 0.001-10 parts by weight of Chen's nitrogenous compound per 100 parts by weight of their resin binder with a reasonable expectation of adjusting sensitivity of their photoresist composition as taught by Fujie. Since the prior art's range for the amount of the nitrogenous compound overlaps with present range of claim 13, the prior art's range would have made present range *prima facie* obvious. See In re Wertheim, supra. Therefore, Chen in view of Fujie would render obvious present invention of claim 13.

With respect to present claims 15 and 17, Chen teaches (col.10, lines 21-44) coating a substrate with a film comprising their lithographic resist composition, and the prior art furthermore teaches the thickness of the dried film made of their lithographic resist composition to be 0.1-5.0 microns, which converts to 100-5000 nm. Since this range overlaps with present range of 100-650 nm of claim 15 and 300-570 nm of claim 17, the prior art's teaching would have made present ranges *prima facie* obvious. See

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In re Wertheim, supra. Therefore, Chen in view of Fujie would render obvious present inventions of claims 15 and 17.

16. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,365,321 B1) in view of Fujie et al (6,303,264 B1) as applied to claim 1 above, and further in view of Sato et al (5,948,589).

Chen et al in view of Fujie et al is discussed above in Paragraph 15. Chen et al in view of Fujie et al do not teach the use of presently claimed carboxylic acid compound of claim 14. However, it is well known in the art to use a carboxylic acid compound in a positive working photoresist composition to prevent an undue decrease in the photosensitivity of the composition due to the presence of an amine compound, and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer. See Sato et al, col.7, lines 54-61. Sato teaches the amount of the carboxylic acid to be 0.01 to 5 wt% based on the amount of a resinous compound having acid-decomposable group. Therefore, it would have been obvious to one of ordinary skill in the art to use a carboxylic acid compound in Chen's composition in the amount of 0.01 to 5 wt% based on the amount of Chen's resin binder with a reasonable expectation of preventing an undue decrease in the photosensitivity of the composition due to the presence of an amine compound and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer as taught by Sato et al. Since the prior art's range overlaps with present range (which converts to 0.01 to

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1wt%), the prior art's teaching would have made present range *prima facie* obvious.

See In re Wertheim, supra. Therefore, Chen in view of Fujie, and further in view of Sato would render obvious present invention of claim 14.

17. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,365,321 B1) in view of Fujie et al (6,303,264 B1) as applied to claim 15 above, and further in view of Padmanaban et al (6,329,117 B1).

Chen et al in view of Fujie et al is discussed above in Paragraph 15. Chen in view of Fujie do not teaches presently claimed antireflection coating film of present claim 16. However, it is well known in the art to provide an anti-reflective coating film between a substrate and a positive working chemically amplified deep UV photoresist composition layer in order to reduce problems associated with reflected light from the substrate and topography during pattern formation. See Padmanaban, col.3, lines 52-56 and col.11, lines 55-67. Padmanaban teaches forming such anti-reflective coating film having thickness of 60 nm on a silicon wafer. Based on Padmanaban's teaching, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to provide an anti-reflective coating film having thickness of 60 nm between Chen's substrate and Chen's photoresist composition layer with a reasonable expectation of reducing problems associated with reflected light from the substrate and topography during pattern formation as taught by Padmanaban et al. Therefore, Chen in view of Fujie, and further in view of Padmanaban would render obvious present invention of claim 16.



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18. Applicants point out that although Kawabe teaches the use of the surfactant in the amount of 50 ppm, the prior art teaches the amount of 68 ppm more preferably. Also, applicants point to the specific examples of Kawabe in which higher concentration of the surfactants are being used. Applicants argue that the defect-decreasing effect obtained with 68 ppm of the surfactant obtained in Example 7a is no better than with a higher surfactant concentration. However, Kawabe clearly teaches that the ratio of the polymer (A) to surfactant (D) is from 500 to 20,000 by weight. Since 20,000 *is clearly included* as the higher end of the *taught range*, it is still the Examiner's position that one of ordinary skill in the art *would immediately envisage* the (A)/(D) ratio to be 20,000. This ratio, when converted to ppm, gives 50 ppm of the surfactant (D) based on the amount of the polymer (A), and this amount of the surfactant taught by Kawabe teaches present concentration of *not exceeding 50 ppm* by weight based on the amount of the resinous compound as presently cited in claim 1. Besides, in In re Mills and Palmer, 176 USPQ 196, it was held that non-preferred embodiments cannot be ignored. Patentee, in the same manner as applicant, is not limited in his teachings to only the exemplified subject matter.

Applicants also argue that defect-decreasing effect is not an object of Fujie et al. However, since the prior art teaches the use of 0.001 wt% surfactant in its invention and since this value meets the present range of 50 ppm or less (which converts to 0.005 wt% or less), it does not make any difference even if the object of the prior art is not the same as the object of present invention.

For the reasons stated above, present rejections still stand.

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19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is (703) 305-0504. The examiner can normally be reached on Monday-Friday from 8:30 am EST to 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ms. Janet Baxter, can be reached on (703) 308-2303. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9311 for after final responses or (703) 872-9310 for before final responses.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0661.

*S. J. Lee*

S. Lee  
8/29/03



ROSEMARY ASHTON  
PRIMARY EXAMINER